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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/934,320	08/21/2001	Craig S. Calvert	PM 99.061	7470

7590 11/28/2005

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EXAMINER	
SAXENA, AKASH	

ART UNIT	PAPER NUMBER
2128	

DATE MAILED: 11/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/934,320	CALVERT ET AL.	
	Examiner	Art Unit	
	Akash Saxena	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *11/16/05*.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-29 have been presented for examination based on the amendment filed on 9th September 2005.

2. Previous non-final office action mailed on 6th June 2005 is incorporated within this office action unless otherwise specified where the more current rejection for the amended claims supercedes the previous rejection.

   Claim 18 is restated in most part and the missing limitation (step (a)) is addressed in as part this office actm.
   35 U.S.C. 103 rejection. Examiner apologizes for the inadvertent omission; however the limitation of claim the limitation presented by claim 18-step (a) was presented earlier in claim 5 and was appropriately rejected. This concern was brought up in applicant-initiated interview on 1st September as well, and the examiner offered to fax rejection for limitation cited in the claim 18-step (a) – identical to the claim 5 rejection, for records purposes. The offer was not entertained. The office has made an attempt to clarify the examiner's position earlier and no new rejection is presented, hence request a non-Final Office Action is denied.

3. The arguments submitted by the applicant have been fully considered. Claims 1-29 remain rejected. The examiner's response is as follows.

Response to Applicant's Remarks

4. Examiner withdraws the objection to claims in view of the amendment to claims 25 & 29.

Response to Applicant's Remarks for 35 U.S.C. 103

5. Claims 1-12 were rejected under 35 U.S.C. 103 (a) by Etgen in view of Gelfand. Applicant's argument regarding establishing a prima facie case of obviousness are considered and are found to be unpersuasive.

Applicant has argued that:

> In the rejection of claims 1-12, the Examiner asserted that Etgen teaches all of the recited features except "optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria." See Official Action, page 5. In an attempt to cure this deficiency, the Examiner asserted that this feature is shown by the Gelfand reference. See id. ***However, the cited references, alone or in combination, fail to disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1.***

Examiner agrees with the applicant that Gelfand (secondary) reference does not explicitly teach the bolded limitation above, however the above limitation is taught by the Etgen (primary) reference in the 35 USC 103 rejection provided in the previous office action. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant has argued that:

> In addition, the cited references, alone or in combination, fail to disclose "***optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria,***" as recited in claim 1. Hence, the cited references cannot render the claimed subject matter obvious.

Examiner disagrees with the applicant. The above-mentioned limitation is taught by Gelfand, showing that the 2D model is optimized to generate a 3D geological model by perturbation (Gelfand: Abstract, Col.1 Line 60 – Col.2 Line 3; Col.5 Line 65 – Col.6 Line 4; Col.8 Lines 3-18). Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Applicant has argued that:

> With regard to the first point, Etgen and Gelfand do not disclose ***"assigning values for at least one rock property in each initial frequency-passband model"*** as recited in claim 1. In the rejection, the Examiner relied on specific passages related to a velocity model and separate single frequency migrated volumes in the Etgen reference to disclose this claimed subject matter. ***However, these passages fail to disclose the claimed subject matter because the velocity model is not a frequency passband model*** and the separate single migrated volumes are created from the velocity model.

Examiner agrees with the applicant that the velocity model is not a frequency passband model. However, the velocity and frequency are mathematically related and proportional quantities over a given distance. Hence the distinction among model formed by velocity or frequency is not patentably different. The only difference the examiner sees in the claimed language is the sequence of steps. Etgen reference assigns the rock properties to the velocity model before forming various frequency passband slices and the applicant assigns rock properties after frequency passband model is formed, both leading to the functionally same results of detailed

accurate "rock parameter" assignment (hence functionally equivalent) (Etgen: Col.3 Line 57-Col.4 Line 17). Etgen does not exclude the frequency passband model as he himself creates frequency slices (Etgen: Fig.1). Further, Etgen teaches using well logs and other non-seismic data to get rock properties and apply them to stacked (velocity model) or un-stacked (frequency passband models) data (Etgen: Col.16 Line 58-Col.17 Line 8).

Applicant has not provided any support as to how the assignment of the rock properties after frequency slicing (leading to frequency passband model) is yields result any different from assignment of rock properties to the velocity model before pre-slicing into frequency bands. Disclosure provided also does not differentiate frequency passband over prior art and is limited in scope as to how the frequency passband model is different from the velocity model (Specification: [0028]-[0030]).

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

Further, Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

MPEP 2183 states:

> MAKING A PRIMA FACIE CASE OF EQUIVALENCE states:
> If the examiner finds that a prior art element
> (A) ***performs the function specified in the claim***,

(B) ***is not excluded*** by any explicit definition provided in the specification for an equivalent, and (C) is an equivalent of the means- (or step-) plus-function limitation, the examiner should provide an ***explanation and rationale*** in the Office action as to why the prior art element is an equivalent.

Steps A, B and C has been explained in clearly above.

U.S. Patent No. 6,131,071 by Partyka et al (cited not used) teaches how a single velocity model is used to a get a composite frequency reflection and based on the reflection assess the rock properties with various non-overlapping frequency passband models in 3D. (Partyka: Fig.1A, 1B, 2 & associate text).

U.S. Patent No. 5,940,778 by Marfurt et al (cited not used) teaches starting analysis with a pre-selected frequency (Marfurt: Fig.6A).

Applicant has argued that:

For the cited passages associated with the velocity model, Etgen describes that a 3-D velocity model, which is described as a specification of the subsurface velocity structure as a function of depth for subsurface points located in the vicinity of the survey, may be written as a convolution of a migration operator with the seismic data. See id. at col. 3, lines 56-61,. col. 5, lines 41-50. As an initial step to this process, the velocity model must be specified with each layer characterized. See id. at col. 5, lines 58-67. That is, assignments are made as part of the velocity model. Further, Etgen describes that an interpreter specifies rock properties for computations associated with the amplitude and travel time. See col. 17, lines 27-62. Clearly, because this velocity model is not a frequency-passband model, assigning rock properties to the velocity model does not disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1. As such, the cited passages associated with assigning rock properties in the velocity model do not disclosed the claimed subject matter.

Further, the passages associated with the single frequency migrated volumes do not disclose the claimed subject matter. In the cited passages, 3-D Fourier transform coefficients, which represent the seismic data, are derived from a discrete 3-D Fourier transform of the common offset data volume. See id. at col. 6, line 62 to col. 7, line 4. With the 3-D Fourier transform coefficients, separate single frequency migrated volumes are computed. See id. at col. 7, lines 5-32. However, it does not appear from these passages that rock property values are assigned as part of the operations that create the single frequency migrated volumes. Indeed, as these single frequency migrated volumes are created from the velocity model, Etgen is not believed to suggest assigning rock properties once the separate single frequency migrated volumes are created. As such, Etgen does not disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1.

As stated above these two are functionally equivalent and, Etgen provides support for both.

Applicant has argued that:

> While the Examiner does not rely on Gelfand for these features, the Gelfand reference does not cure the deficiencies of Etgen. Gelfand describes a method of creating a two dimensional lithologic model within subsurface earth layers over an extended region. See Gelfand, col. 2, lines 46-49. In Gelfand, the model is constructed by converting a set of successive processed seismic reflection time-scale traces to a plurality of depth scale models in terms of the layer parameters. See ftf at col. 2, lines 50-56. Then, a set of synthetic time-scale traces are computed and compared with the original traces. See id at col. 2, lines 56-58. The parameters are then varied to match the synthetic time-scale traces with the original traces. See id. At col. 2, lines 58-67. Clearly, the method of Gelfand does not disclose or suggest generating a frequency-passband model, ***much less assigning values for rock property in frequency-passband models***. As such, Gelfand does not disclose "assigning values for at least one rock property in each initial frequency-passband model" as recited in claim 1.

Although not relied upon Gelfand teaches claim 1 steps (b)(c)(d) (Gelfand: Col.5 Line 65 – Col.6 Line 4; Col.2 Lines 49-67; Col.8 Lines 12-18). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant has argued that:

> With regard to the second point, the references, alone or in combination, do not disclose or suggest "***optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria"'*** as recited in claim 1. As noted above, the Examiner acknowledges that Etgen does not disclose teach this claimed subject matter***. Indeed, in Etgen, the individual single frequency migration volumes do not even appear to address rock properties.*** As such, Etgen does not disclose the claimed subject matter.

As stated above these two are functionally equivalent and, Etgen provides support for both. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant has argued that:

> *The Gelfand reference does not cure the deficiencies of Etgen.* In relying on . Gelfand, the Examiner cited to the abstract of Gelfand to disclose this recited feature. See Official Action, Page 5. However, as noted by the Examiner, ***Gelfand simply teaches perturbing model-parameters in a two-dimension lithologic model. See Gelfand, Abstract.*** This passage does not disclose or teach optimizing a three-dimensional geologic model, much less optimizing the three-dimensional geologic model by perturbing rock property values in at least one frequency-passband model. As such, Gelfand does not disclose ***"optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria***," as recited in claim 1.
> ***Accordingly, in view of the remarks set forth above, Applicants respectfully submit that the Etgen and Gelfand references cannot support a prima facie case of obviousness.*** Therefore, Applicants respectfully request the Examiner's withdraw the rejection and allow the pending claims 1-12.

Examiner finds applicant's arguments unpersuasive. Gelfand starts with an perturbing initial 2D model, however the teaches forming a 3D model can be formed likewise (Gelfand: Col.1 Line 60-Col.2 Line 3). Further, 3D perturbing is known in the art (See U.S. Patent No. 6,078,334 A, 4,653,855 A, US 5,937,362 A). Thus the combination of Etgen and Gelfand form a prima facie case of obviousness to a person of ordinary skill in the art. Rejections to claims 1-12 are maintained.

6. Claims 13-25 and 27-29 were rejected under 35 U.S.C. 103 (a) by Etgen, in view of Gelfand, further in view of Jones.

Applicant has argues that:

> As a preliminary matter, in the rejection of claim 18, the Examiner does not cite any portion of the prior art as disclosing step (a) of the method. Thus, Applicants are unable to properly respond to such a rejection. Accordingly, if the rejection of this claim is maintained, Applicants respectfully request a non-Final Office Action to allow Applicants to properly respond to that rejection.

Examiner apologizes for the inadvertent omission; however the limitation of claim the limitation presented by claim 18-step (a) was presented earlier in claim 5 and was appropriately rejected. This concern was brought up in applicant-initiated interview on 1st September as well, and the examiner offered to fax rejection for limitation cited

in the claim 18-step (a) – identical to the claim 5 rejection, for records purposes. The offer was not entertained. The office has made an attempt to clarify the examiner's position earlier and no new rejection is presented, hence request a non-Final Office Action is denied.

Further, applicant's arguments for claims 13-25 and 27-29 are primarily concerned with Etgen and Gelfand not addressing the base independent claim limitation discussed above. Response to arguments is presented above and applies here as well. No new arguments are made against Jones reference, other than piecemeal analysis relating to teaching of Etgen. Rejection for claims 13-25 and 27-29 is maintained.

7. Claim 26 was rejected under 35 U.S.C. 103 (a) by Etgen-Gelfand-Jones in view of applicant's own admission.

Applicant's arguments for claim 26 are primarily concerned with Etgen, Gelfand and Jones not addressing the base independent claim limitation discussed above. Response to arguments is presented above and applies here as well. No new arguments are made against applicant's own admission, other than piecemeal analysis relating to teaching of Etgen. Rejection for claim 26 is maintained.

Claim Rejections under 35 USC § 103 for clarification

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. **Claims 13-25, 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,049,759 issued to John T. Etgen (Etgen '759 hereafter), in view of U.S. Patent No. 4,679,174 issued to Valery A. Gelfand (Gelfand '174 hereafter), further in view of U.S. Patent No. 5,838,634 issued to Thomas A. Jones et al (Jones '634 hereafter).**

Regarding Claim 18

Etgen '759 teaches step (b) as assigning a velocity model consisting of horizontally layered constant velocity media within area of interest (Etgen '759: Col.5 Lines 41-47; Col.17, Lines 38-41, 48-63) to the single frequency model (Etgen '759: Col.6 Lines 1-3, 22-26). Further, Etgen '759 teaches that other sources like well data can be combined to enhance the single frequency model (Etgen '759: col.16 Lines 61-67).

Further, Etgen '759 teaches step (c) as summing up all the individual frequency models to create a complete three-dimensional geological model (Etgen '759: Col.7 Lines 33-35).

Etgen '759 does not teach steps (a) & (d)-(l).

Gelfand '174 teaches step (a) that initial model is made based on the limits defined in the region and stratigraphics (Gelfand '174: Col.4 Lines 25-36). Etgen '759 teaches 3-D array (matrix) of contiguous model blocks representing the portions of subsurface earth volume (Etgen '759: Col.6 Lines 22-26; Figure 8A).

Gelfand '174 teaches step (d) as optimizing the initial model by the process of perturbing the rock properties (Gelfand '174: Abstract).

Jones '643 teaches Step (e) as specifying training information corresponding to the desired components or criteria consistent with the model (Jones '643: Col.18 Lines 34-36).

Jones '643 teaches Step (f) as calculating statistics for the properties of initial model (Jones '643: Col.18 Lines 36-39).

Jones '643 teaches Step (g) as calculating objective function (Jones '643: Col.19 Lines 4-10).

Jones '643 teaches Step (h) as perturbing the rock properties (Jones '643: Col.19 Lines 30-33). Gelfand '174 also teaches perturbing as shown above.

Jones '643 teaches Step (i) as calculating the objective function for the new tentative model (Jones '643: Col.20 Lines 51-52).

Jones '643 teaches Step (j) as retaining perturbed rock property values and the new tentative objective function if the objective function is reduced (Jones '643: Col.20 Lines 60-67).

Jones '643 teaches Step (k) as repeating the steps (h) through (j) until the objective function is reduced to a specified limit (Jones '643: Col.21 Lines 13-21).

Jones '643 teaches Step (l) as outputting the geological model to a file (Jones '643: Col.21 Lines 22-23).

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to take the teachings of Gelfand '174 and apply them to Etgen '759 to create a 3D geological model from various frequencies and perturb the rock data to achieve the desired degree of correspondence with real

data. Although Gelfand '174 is teaching a 2-D Model geological model, the motivation to combine would be that Gelfand '174 teaches the process of geological modeling using the process of perturbing, which can change the underlying geological model to achieve the desired result in iterative steps (Gelfand '174: Abstract). Etgen '759 teaches performing 3-D seismic analysis and model but processes the information much more efficiently (converting the data to frequency domain using Fourier transform) as the data collected is much more (Etgen '759: Col.1 Lines 40-45). Combing the two reference will yield more truer picture 3-D geological model (Etgen '759: Col.3 Lines 14-20) and perturbation will make the model more precise to actual (Gelfand '174: Abstract).

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to take the teachings of Jones '643 and apply them to Etgen '759 to create frequency-passband geological model. The motivation would have been that frequency pass-band based geological models proposed by the Etgen '759 are not optimized based on the ability to perturb individual rock properties and Jones '643 provides that capability (Jones '643: Col.6 Lines 62-65) leading to better trained model based on iteration. Further motivation to combine comes from Etgen '759 as performing transformation speeds up the depth-amplitude-time seismic data processing (Etgen '759: Col.5 Lines 41-58; Jones '643: Col.10 Lines 38-41).

It would have been obvious to one (e.g. a designer) of ordinary skill in the art at the time the invention was made to take the teachings of Gelfand '174 with Jones

'643 to create 3-D geological model where rock properties are perturbed to enhance the model. The motivation would have been that Gelfand '174 performs the same process as Jones '643, but builds a 2-D geological model (Gelfand '174: Abstract) where as Jones '643 teaches how to build a 3-D geological model with separate objective function to accuracy of the model (Jones '643: Abstract).

Conclusion

9. All claims are rejected based on the prior art used/cited in previous office action.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Akash Saxena whose telephone number is (571) 272-8351. The examiner can normally be reached on 8:30 - 5:00 PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jean R. Homere can be reached on (571)272-3780. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Akash Saxena
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Friday, November 18, 2005

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